United States
Department of
Agriculture

Forest Service

Fire Management Notes

Volume 49, No. 1
1988

Fire Management Notes

An international quarterly periodical devoted to forest fire management

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Contents

Fire Management Notes is published by the Forest Service of the United States Department of Agriculture, Washington, D.C. The Secretary of Agriculture has determined that the publication of this periodical is necessary in the transaction of the public business required by law of this Department.

Subscriptions may be obtained from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

Send suggestions and articles to Chief, Forest Service (Attn: Fire Management Notes), P.O. Box 96090, U.S. Department of Agriculture, Washington, DC 20090-6090.

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Cover: 1923 firewagon of the Massachusetts Forestry Department. Note grub hoes under rear and shovels on running board.

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Wilderness Fire Management in Region 8

Jim Lunsford

Fuels specialist, USDA Forest Service, Atlanta, GA

The Wilderness Act of 1964 (Act) with amendments of 1978 mandates that an enduring resource of wilderness be acquired for the enjoyment of the American people and for future generations. Wilderness is defined as "an area where the earth and its community of life are untrammelled by man, where man himself is a visitor who does not remain." Wilderness is also defined by the Act as an undeveloped Federal area "protected and managed so as to preserve its natural conditions and which...has outstanding opportunities for solitude...." The Act further directs agencies to manage wilderness to preserve natural ecological conditions.

All unplanned man-caused fires are considered wildfires.

Policy

The current wilderness fire management policy has two objectives:
1. To permit lightning-caused fires to play, as nearly as possible, their natural ecological role within wilderness. This means allowing a lightning-caused (natural) fire to burn, unrestrained, if it is burning under conditions presumed to have existed when fire burned naturally—before man created unnatural conditions by suppressing all fires thus permitting natural fuels to accumulate. No fire will be ignited or allowed to burn without documented, preplanned, and specified conditions. If presumed natural conditions do not exist at the time the fire is ignited by lightning, the fire must be declared a wildfire and suppressed, following directions for suppression of wildfires. Prescribed fire may be used to reduce an unnatural fuel accumulation to a level that represents natural conditions, whereby a naturally ignited fire may burn without causing unacceptable resource damage. Specific objectives, standards, and guidelines for each wilderness must be documented in a Forest plan. Man-caused fires must be considered wildfires and suppressed as such.
2. To reduce, to an acceptable level, the risk and consequences of wildfire within wilderness or escaping from wilderness. This permits prescribed fire to be used to reduce fuel accumulations to a level that will ensure maintenance of the wilderness character by preventing destruction by wildfire. This objective is twofold in that it protects both the wilderness and the values outside the wilderness. When treatment of fuels and/or protection outside the wilderness will not ensure the values outside the wilderness, prescribed fire may be used inside the wilderness to ensure that a wildfire will not escape from within the wilderness, causing unacceptable damage to property and/or resource values outside the wilderness.

Kinds of Fire

This policy seems to be compatible with the intent of the Wilderness Act. Following then, there are only two kinds of fire—**wildfire** and **prescribed fire:**

- **Prescribed fire** by definition is a wildland fire burning under preplanned, specified conditions, to accomplish specified resource management objectives (FSM 5100).
- **Wildfire** is a wildland fire not designated and managed as a prescribed fire (FSM 5100).

Suppression

Wilderness Fire Management in FSM 2324 states that all wildfires will be suppressed in accordance with direction for wildfire suppression in FSM 5130. The objective of wildfire suppression is to suppress all wildfires at minimum cost consistent with land and resource management objectives and fire management direction.

Fire management direction must be developed in the Forest Land Management Plan for each wilderness. Each wilderness must be identified as a separate management area.

Suppression strategies appropriate to meet management direction range from direct control, minimizing acreage burned, to more indirect methods of containment and confinement.

Confine—To limit fire spread within a predetermined area principally by use of natural or preconstructed barriers or environmental conditions. Suppression action may be minimal and limited to surveillance under appropriate conditions. The confine strategy is applicable both inside and outside wilderness as is all the suppression strategies. The confine strategy is based on the premise that the fire is a wildfire and will be principally confined by natural barriers such as streams, lakes, rock slides, fuel breaks (road, trails, etc.), weather conditions (i.e., high humidity or rain) or preconstructed fire breaks. Surveillance and minimal line holding is the only suppression action permitted. Surveillance must be approved by the Regional Forester by approval of the Forest Land Management Plan or interim plan as permitted. A wildfire cannot be used to accomplish management objectives such as habitat maintenance or vegetative diversity. However, these benefits may accrue as a result of application of other uses of fire. Should conditions change from that used in calculating the fire behavior indicating the fire would be self-contained, another strategy must be employed, i.e., contain or control.

Contain—To surround a fire, and any spot fires therefrom, with control line as needed, which can reasonably be expected to check the fire's spread under prevailing and predicted conditions. Use of the contain strategy permits, in addition to surveillance, the construction of additional fire lines necessary to contain the fire based on predicted behavior, as calculated from weather forecasts and fuel conditions. When the fire cannot be contained as predicted because uncontrollable conditions persist, another strategy must be employed, i.e., control. Nonetheless, it is imperative that the selected strategy be reviewed each day to ensure the strategy is applicable for the upcoming burning period.

Control—To complete the control line around a fire, and any spot fires therefrom, and any interior islands to be saved; burn out any unburned area adjacent to the fire side of the control line; and cool down all hot spots that are immediate threats to the control line, until the line can reasonably be expected to hold under foreseeable conditions. The strategy is self-explanatory except that in wilderness areas, additional (wilderness values) consideration must be employed. Once the decision to control has been made, then the fire must be controlled and cannot be reclassified.

This wilderness policy hinges on economics and is best defined as suppressing a fire when suppression cost plus resource damages would not exceed the value of the resources protected. Once a wildfire has exceeded the capability of initial attack forces to suppress it an Escaped Fire Situation Analysis is the document used to determine the appropriate suppression action. The philosophy applies in wilderness as well as outside wilderness. In wilderness we are expected to conduct all fire management activities in a manner compatible with overall wilderness management activities and also to give preference to using methods and equipment that cause **the least**

- Alteration of the wilderness landscape.
- Disturbance of the land surface.
- Disturbance to visitor solitude.
- Reduction of visibility during periods of visitor use.
- Adverse effects on other air quality related values.

In suppressing wildfires in wilderness one must consider the effects of the suppression action on the wilderness values versus the effects the fire may have on wilderness values.

When a wildfire will be self-contained and is not causing unacceptable resource damage, a suppression effort other than

surveillance would be inappropriate. The Regional Forester must approve the use of surveillance. When a wildfire is causing unacceptable resource damage or life and/or property is threatened, the appropriate suppression strategy is control. Yet, in the control mode, one must consider the effects of suppression on overall wilderness management objectives. A fire burning with an intensity (low) that can be suppressed at or near the wilderness boundary, or even outside the boundary, prior to causing damage to private property, etc., may be better managed by not initiating suppression action inside the wilderness. The suppression effort, unless conducted with hand tools that will not leave a lasting scar, may cause more damage than the fire causes. The determination on suppression action will have been made in the planning process for the Land Management Plan. More explicitly, the plan should state under what conditions and fire intensity a fire will cause unacceptable resource damage. These factors should include a description of the fuels, fuel loading, atmospheric conditions, drought conditions, and affected resources. The suppression strategy is somewhat predetermined during the planning process.

In the absence of an interim plan or completed Land Management Plan, all wildfires will be controlled in wilderness.

Prescribed fire

There are two types of prescribed fire:

- Those ignited by lightning and allowed to burn under prescribed conditions, and
- Those ignited by qualified Forest Service officers.

Specific objectives, standards, and guidelines for the use of prescribed fire within each wilderness must be documented in a forest plan (or interim plan if the forest plan is not complete). Project funds must be used to conduct all prescribed fire.

Prescribed fires ignited by Forest Service officers may be used only for fuels reduction that meets the objectives of fire management in wilderness. Do not use prescribed fire to benefit wildlife, maintain vegetative types, or improve forage production unless it has been prior to designation of an area as wilderness, or to enhance other resource values. These benefits may result from other uses of prescribed fire or natural fire.

Before prescribed fire is used in wilderness areas, the following conditions must be met:

- The use of prescribed fire or other fuel treatment measures outside of wilderness is not sufficient to achieve fire management objectives within wilderness. That is, when conditions inside a wilderness pose a threat to values outside the wilderness, then prescribed fire may be used inside the wilderness to reduce or eliminate that threat.
- An interdisciplinary team recommends the use of prescribed fire.
- The interested public has been appropriately involved in the decision.
- Lightning-caused fires are not allowed to burn because they pose a serious threat to life and/or property within the wilderness or to life, property, or natural resources outside the wilderness.

The use of prescribed fire in wilderness for fuel reduction must be approved by the regional forester. Other uses of prescribed fire must be approved by the Chief of the USDA Forest Service. Such approval has been given only once and that to promote the propogation of a rare and endangered plant in Shining Rock Wilderness in North Carolina.

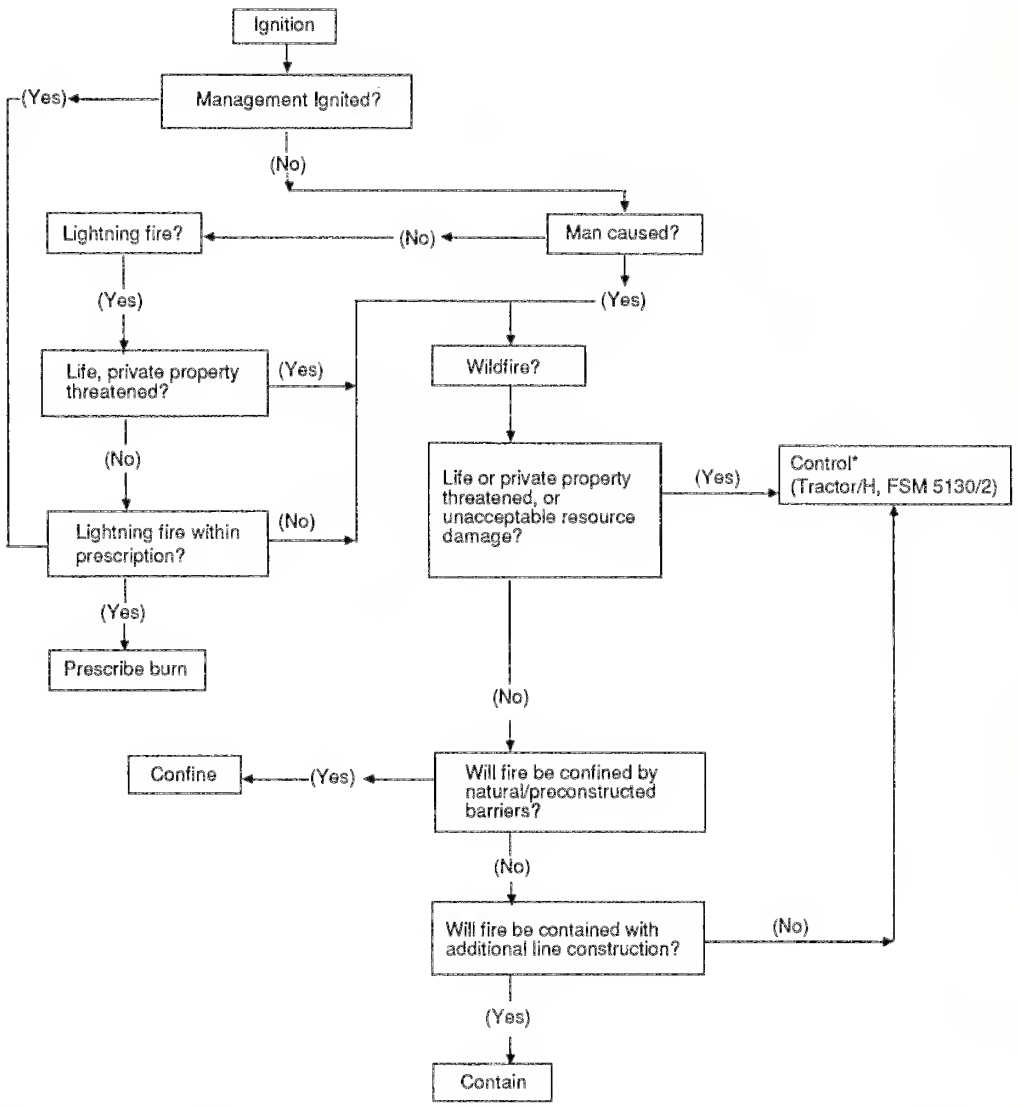
The plant is Golden Mountain Heather (Hudsonion Montana), which is fire dependent and will become extinct (theoretically) when protected from fire. Prescribed fire may also be used for range habitat improvement provided the use was practiced prior to the designation of the area as wilderness.

Restoration of suppression action must be accomplished by methods compatible with wilderness management objectives. The use of tractors for restoration is not inherent in the approval of the use of tractors for fire suppression. Carte blanche use of power equipment in wilderness is inappropriate.

The wilderness fire management model flow chart (fig. 1) can be used to arrive at the appropriate response to an ignition in wilderness.

Two other significant points are that a man-caused fire may be managed as a prescribed fire outside wilderness but must be considered a wildfire inside wilderness. When, in the process of conducting a prescribed fire, conditions change that render the prescribed fire "out of prescription" and not capable of being returned to prescription with forces available using project funds, the prescribed fire must be suppressed as a wildfire. Once a prescribed fire has been declared a wildfire it cannot be returned to a prescribed fire.

Figure 1 - *Wilderness fire management model.*



**Control can be accomplished by tractor, handline crews, or both.*

Use of motorized equipment

Motorized equipment may be used in wilderness provided the place and circumstances are specified in the forest plan and that the use is necessary for management and protection of the wilderness resource. The approval for use of tractors is limited to the Regional Forester while the Forest Supervisor may approve the use of other types of power equipment for a fire emergency and for valid mining claims.

Summary

Wilderness fire management direction will be defined in the Land Management Plan. Suppression of wildfire in wilderness must use tactics and equipment that cause the least impact on the wilderness values which include:

- Alterations of the landscape.
- Disturbance of surface area.
- Disturbance to visitor's solitude.
- Reduction of visibility.
- Adverse effect on air-quality-related values.

Suppressing a fire inside a wilderness may cause a greater impact on wilderness values than the fire will cause if suppressed outside the wilderness. The Forest Service wildfire suppression policy permits a suppression strategy that is flexible to allow an effort other than an all-out control action. The suppression strategy selected must be based on an economic analysis of the cost of suppression versus the damage that may be caused by the wildfire.

Prescribed fire may be used to reduce unnatural fuel levels to a natural level that will permit lightning-caused fires to play their natural role. Also, prescribed fire may be used to reduce the fuel loading inside a wilderness when that level of fuel loading poses a threat to life and property inside the wilderness or a threat to life and property or resource values outside the wilderness, should a wildfire occur inside the wilderness. Two types of prescribed fire are permitted:

- Those ignited by lightning and managed as a prescribed fire burning under preplanned conditions.
- Those ignited by forest officers to meet the objective of fire management in wilderness.

All other fires must be classed as wildfire and suppressed according to Forest Service policy.

In developing the economic analysis for selecting the suppression strategy and tactics to employ, one must consider the cost of removing equipment from the wilderness, the cost of restoration of surface disturbance, and the cost of loss of property, as well as resource values, when the fire burns outside the wilderness. ■

Know Thy Neighbor—The Key to Unified Command

Douglas J. Riley

Park ranger, Delaware Water Gap National Recreation Area, National Park Service, Columbia, NJ

Unified command, as used in the Incident Command System (ICS), is defined as "a method for agencies or individuals who have either geographic or functional jurisdiction at an incident to come together in a common organization, determine overall objectives, and select the strategy and action to achieve the objectives." What this means, essentially, is that during a multi-agency incident, any agency that has a "jurisdictional interest" in the incident should participate as an active member of the unified command. The makeup of the unified command structure will depend on:

- The **location** of the incident, i.e., which political jurisdictions are involved.
- The **kind** of incident, i.e., which functional agencies of the involved jurisdictions are needed to handle the incident.

Under ICS, a unified command structure is called for under two basic sets of circumstances:

- The incident is totally contained within one jurisdiction, but more than one department or agency shares the management responsibility because of the nature of the incident, the kinds of resources required, or the statutory obligations, e.g., a major passenger airliner crash.
- The incident is multijurisdictional in nature, e.g., a major wildfire or a large-area earthquake.

Under the unified command structure, the unified command has the responsibility for jointly developing objectives, strategies, and priorities. Once a consensus has been reached regarding the incident objectives, it is up to the Plans Section, in cooperation with the other sections, to develop the Incident Action Plan (IAP). Once the IAP has been developed and approved by the unified command, the operations section chief is responsible for carrying it out. Normally the operations section chief will be from the agency that has the greatest jurisdictional involvement. Designation of the operations section chief should be agreed on by all agencies having jurisdictional and funetional responsibility at the incident.

One of the biggest fears that people seem to have regarding the unified command structure is that they will be "robbed" of their jurisdictional authority. However, the keystone to unified command is that **jurisdictional authority will not be compromised.** What this means is that all agencies having jurisdictional authority at a multijurisdictional incident should contribute to the process of:

- Developing the overall incident objectives.
- Selecting strategies.
- Ensuring that joint planning for tactical activities is accomplished.
- Ensuring that integrated tactical operations are conducted.
- Maximizing the use of assigned resources.

Another fear that people have regarding the unified command structure is that it is "management by committee." Under a properly run unified command structure, nothing could be further from the truth. In fact, the unified command can actually help a large-scale inci-

Multi-agency cooperation is the strength of the unified command structure.

dent to run more smoothly since the concerns and ideas of all involved agencies are taken into account when the Incident Action Plan is developed. Were all of the involved agencies to just go off and "do their own thing," the incident could easily turn into a three-ring circus at best! As previously discussed, once the Incident Action Plan is developed, it is then the responsibility of the Operations Section Chief to implement it using all of the resources assigned to the incident, regardless of what agency they represent.

It is in the operation of the unified command and the selection of the Operations Section Chief that "knowing thy neighbor" comes into play, as it is much easier to work with a known quantity than with an unknown quantity. By this I mean that if you have made the effort to "know your jurisdictional neighbors," you should already have a fairly good grasp of their concerns and ideas before a major incident occurs. You should also have a fairly good knowledge of their available command and/or general staff qualified personnel, as well as their available resources. One way to do this is to conduct multijurisdictional preplanning sessions centered around the various types of emergencies that you could encounter that would involve you and your neighbors. By working together in such planning sessions you not only get to really know your neighbors, but you also avoid needless duplication on the part of the various agencies involved. This is the time to get everybody's thoughts, ideas, concerns, etc., out into the open where they can be discussed and worked into a viable preplan. Ideally, this preplan should be field tested in a multijurisdictional exercise so that any problems can be ironed out before the real thing happens. Once these preplans have been completed they should be reviewed annually by an inter-agency working group for the purpose of updating and/or revising them as needed.

So, as you can see, getting to "know thy neighbor" is a lot more than just stopping by for a cup of coffee now and then. It entails a lot of hard work on the part of all involved jurisdictions but, in the long run, it is well worth it! ■

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Leadership Strategies for Incident Management Teams

T.C. Harbour, Jr.

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Leadership is a key in any successful venture and especially critical in incident management. Leadership is the key to effectively accomplishing identified incident objectives. Recently, management literature has analyzed some qualities of leadership. In the acclaimed best-selling book, *Leaders,* by Warren Bennis and Burt Nanus,[1] the authors outline four leadership strategies:

- Attention through vision
- Meaning through communication
- Trust through positioning
- Deployment of self through **positive self regard** and **the Wallenda factor.**

The authors' research led them to conclude that successful and effective leaders develop and utilize these four strategies. They characterize leaders as those who are concerned with doing the right thing and managers as those who are concerned with doing things right. They believe success is more dependent on leadership than management.

Based on my experience and observations, I believe that the success of incident management teams can be correlated to the points that Bennis and Nanus make. I believe successful incident management teams, especially in the context used by Bennis and Nanus, are more truly characterized as leaders than managers. The authors believe leaders are effective (guiding activities of vision and judgment), while managers are efficient (mastering routine activities). The book carefully expounds on the substantive differences between leaders and managers. I would encourage those interested to read and study the book. It is an extremely worthwhile and enjoyable text.

A visible incident command team is an effective symbol of leadership.

The first major point of "Leaders" is that leaders capture "Attention through Vision" by:

- Creating focus. Unified focus is the management of attention through vision.
- Focusing on the leader's agenda. The creation of focus of interest also entails a capacity to obtain focus on the agenda the leader wishes.
- Creating agenda.
- Inspiring a vision that grabs.
- Being concerned with outcome.
- Managing attention that creates a presence that attracts.
- Creating a playground appeal.
- Paying attention.

An incident management team captures "Attention through Vision" by:

- Focusing on line officers' clear objectives and the actions the team implements to accomplish them.
- Focusing on clear delegation of authority and clarity of performance standards.
- Clearly defining the task.
- Displaying and understanding the Incident Commander's objectives.
- Developing a vision to accomplish the Incident Commander's objectives.

[1]Copyright 1985. Published by Harper and Row, Publishers, Inc.

- Constantly focusing on the successful outcome of the incident objectives at briefings/debriefings/planning meetings, etc.

The second major point of Bennis and Nanus is that meaning is created through communication. This meaning is created and established as:

- Workers recognize and get behind something of established identity.
- There is dependence on the existence of shared meanings and interpretations of reality. These shared meanings and interpretations facilitate coordinated action.
- The actions and symbols of leadership are evidenced, which frame and mobilize meaning.
- There is influencing and organization of meaning for members of the organization.
- There is understanding that getting the message across unequivocally at every level is an absolute key.
- Leaders manage meaning by articulating, building models, drawing pictures, making symbols, and through metaphors and music.
- Leaders make something real that wasn't there before.
- Leaders make something to get behind.

The way an incident management team institutes leadership is by making sure that:

- There is an established identity and an understood purpose.
- There are shared meanings, a comradeship of past experiences, and a backbone of strong, committed crews and individuals.
- Incident Management Teams clearly and visibly set up an organization and display it.
- The organization knows why they are there and what job they are to do.
- The message is displayed and the task at hand is understood by all members of the organization.
- The actions and meanings of successful teams mobilize meaning and build toward accomplishment of a task.
- The accomplishment of a task becomes a reality.

The third important point is that there is "Trust through Positioning." In the book, leaders are defined in these terms:

- Trust is the lubrication that makes it possible for organizations to work.
- Trust is the glue that maintains organizational integrity.
- The leader must be the epitome of clarity, constancy, and reliability. Through establishing the position and more important, staying the course, leadership establishes trust.

- An organization possesses a healthy structure when it has a clear sense of what it is and what it is to do.
- Leaders disclose themselves and make themselves known to others; they clarify boundaries and constraints and make them visible. They lack hidden agendas.

An incident management team builds confidence by making sure that:

- Key individuals are organized into a cohesive unit; this promotes trust, constancy, and reliability.
- There is a clear sense of what it is the team is to do and even of what the team is itself.
- Teams stay the course; there is reliability and consistency.
- Objectives and meanings are displayed "up front," with no hidden agendas.

Nanus and Bennis also believe in "Deployment of Self" through:

(A) Positive Self-Regard—

- Leaders are adept at recognizing strengths and compensating for weakness. This represents the first step in achieving positive self-regard.
- Leaders nurture the skills of discipline, i.e., they develop talents.
- Leaders have the capacity to discern the fit between one's perceived skills and what the job requires.
- The result of positive self regard by leaders is induced positive self regard in employees.
- Leaders have strong egos, but not engulfing egos. They know their worth and their talents.

They know their skills. They focus on doing "right things." They focus on a goal and do not deviate from it. They have positive self regard and value, respect, trust, and find strengths in others.

(B) "The Wallenda Factor":

- Leaders put all of their energies into their task. They simply don't think about failure.
- For successful leadership to occur there has to be a fusion between positive self regard and optimism about a desired outcome.

Incident management teams successfully deploy themselves when:

- Teams compensate for individual weaknesses. They generate a sense of feeling good about the team and the incident organization.
- There are very real objectives that focus all the energies of the organization into that task; failure is not accepted nor tolerated.
- The successful competition and selection for team membership at all levels leads to positive self-worth and healthy egos. These personal benefits are achieved through the symbiosis of team association and membership.
- There is realism and tempered optimism about desired outcomes.

Bennis and Nanus conclude that successful implementation of their four strategies leads to **empowerment** and that effective leaders empower others to translate intention into reality and sustain it.

As incident management teams implement the four strategies discussed in the book, they also empower. As a result the entire incident organization is infused with:

- Significance—an understanding that the accomplishment of the Incident Commanders and Line Officers objectives is very important and worthwhile.
- Competence—a continued demonstration of skills exhibited under obviously stressful situations.
- Communications—a shared experience and understanding.
- Enjoyment—a feeling of "a job well done."

The final result is a successful experience for all involved. Leadership is a key to incident management and those teams that lead the best are most effective. ■

Fire is the Tie That Binds

Linda Smith and Bonnee Turner

Respectively, graphics technician and training specialist, National Advanced Resource Technology Center, Marana, AZ

While Americans rallied last summer to help their neighbors fight the raging infernos in the forested West, firefighters in Chile helped their Argentinian counterparts put out a 20,000-acre fire in the Andes Mountains.

What's so unusual about this seemingly simple act of assistance is that less than 10 years ago these two countries were inches away from going to war with one another.

The camaraderie they developed attending a firefighting course brought them together.

Firefighting skills and friendship are being exchanged again this year as the Forest Service and several Spanish-speaking countries prepare for the fourth annual "Curso Internacional de Combate de Incendios Forestales" (international firefighting course), to be hosted by Mexico in January 1988.

Eighteen course instructors from Chile, Spain, Mexico, Costa Rica and the United States met October 5-9, 1987, at the National Advanced Resource Technology Center (NARTC), Marana, AZ, to put together a master course needed for an expected group of 60 international firefighting students. Emphasis was directed toward wildfire in Central and South America.

NARTC, the Forest Service's national training center, was a logical choice for the faculty meeting. It provides coordination and support for the bi-annual firefighting course. It also has the staff and equipment to generate hundreds of lesson plan pages and visual aids (all in Spanish) in 4 days so they could be hand-carried to Mexico for reproduction.

Course faculty from Chile, Spain, Mexico, Costa Rica, and the United States plotting course strategy.

The reunion was extra special because several instructors attended the first two courses as students when NARTC hosted the pilot courses in 1983 and 1984. Subsequent courses have been in Argentina, Chile and Venezuela.

The firefighting course, which pools knowledge from countries with an array of experience levels, is funded as the result of an agreement between the U.S. Agency for International Development (USAID) and the Department of Agriculture's Office of International Cooperation and Development. That agreement formed the Disaster Assistance Support Program (DASP).

DASP is part of the Forest Service's International Forestry Program. It provides preparedness and disaster help to countries on request from the Office of U.S. Foreign Disaster Assistance (OFDA). DASP recently sent Forest Service experts to Africa to help control a severe locust and grasshopper outbreak.

All the countries involved in the international firefighting course have responsibility for protecting forested land and could experience a disastrous wildfire situation.

Participants are employees of their respective governments and represent a melting pot of viewpoints. The countries involved knew they'd have to break strong political barriers if the course was to be successful. One of the first things the

NARTC Assistant Director Phil Parks briefs faculty on NARTC facilities.

students did at the 1983 course was to write and sign a charter. All agreed to put aside prejudice in the spirit of friendship and cooperation.

Jay Perkins, Forest Service Course Steering Group Chairman (who's Timber Management Officer on the Klamath National Forest's Ukonom Ranger District, Region 5—when he's not wearing his international hat), remembers that moment vividly.

"The first year was the roughest. It was basically North Americans putting the course together with three Chileans. But it was probably the most special because of the friendships that were developed and built on throughout the years."

Perkins knows the value of friendship firsthand. He met Chilean instructor Fernando Maldonado when he (Perkins) was a Peace Corps volunteer in Chile from 1978-80.

Perkins' fluent Spanish, knowledge of Latin American culture, and participation in other international forestry projects make him a prime choice for this assignment. He is joined by other Forest Service faculty members: Gary Benavidez, Fire Management Officer for the Cibola National Forest's Magdalena Ranger District, Region 3; Paul Weeden, in charge of the Forest Service's Defense and Emergency Operations, Washington Office Fire and Aviation Management Staff; Robert Rodriguez, Fire Management Officer, Illinois Valley Ranger District, Siskiyou National Forest, Region 6; and Pat Velasco, Fire Management Officer for the Tonto National Forest's Payson Ranger District, Region 3.

Perkins and Benavidez were at the Andes Mountains fire this summer. Maldonado quickly acknowledges the brotherhood the firefighting courses have fostered. The United States sent personnel, hoses, and pumping equipment. His country (Chile) sent a 60-member task force to help the Argentinians.

"That's the kind of friendship created by these courses," he said.

Maldonado is a Planning and Studies Section Chief, Fire Management Department, for "Corporacion Nacional Forestal (CONAF)," the Chilean "Forest Service."

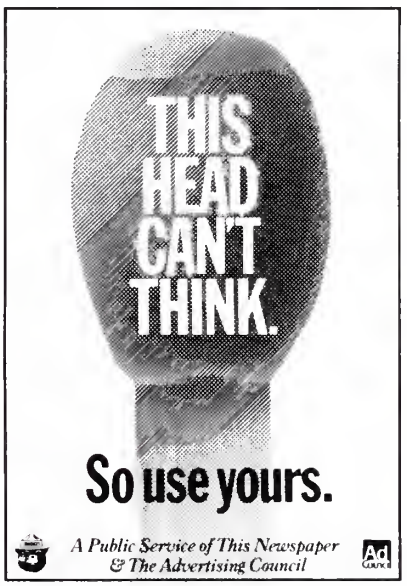
Much of the country's timber is on lands owned by private companies, but the government plays a big role in their prosperity by providing reforestation incentives and some firefighting assistance.

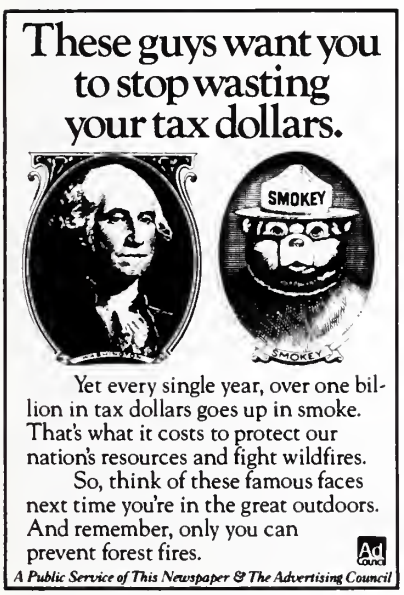
Maldonado says Chile's level of firefighting sophistication is relatively strong in attack and suppression but his co-workers want more fire behavior knowledge. The government allocates 45 percent of its total forestry budget for fire management and just replaced some of its 14-year-old equipment with almost $3 million worth of radios and other goods purchased from the United States and Canada.

Maria Luisa Alfaro, a forester in charge of training for the National

Park Service, Costa Rica, said she is eager to pass on most phases of firefighting knowledge to her country, which is just beginning to put emphasis on fire control. Alfaro is the first female faculty member and first Costa Rican course representative.

The Forest Service shares its wildland firefighting knowledge on an international scale as part of a 1985 agreement between USAID and DASP. It's a major role, according to Bonnee Turner, NARTC training specialist in charge of international fire training. Turner attended the Steering Group meeting in Mexico City in June this year. She may go to Spain next year to prepare for the 1990 course.





Turner remarks: "The United States has a great deal of technology in wildland fire suppression. We are sharing this knowledge, our experiences, and mistakes with other countries. But we also must realize that we can learn from others as they learn from us.

"To play a small role in a project of this magnitude is adding a new dimension to my career and giving me an opportunity of a lifetime to feel I am helping others in areas we often take for granted."

Roberto Martinez, Host Country Course Coordinator and Assistant Director of Fire Control for the Mexican government, is looking forward to hosting the course January 25 through February 12 in Mexico City. The course will take place at the government's "Natural Resource Conservation Center," a training facility that trains park guards and provides other natural resource related courses.

Most of Martinez's country's lands are "ejidos" (community-owned). The government has firefighting responsibilities but is assisted by people living in the respective communities. Although the international course will be attended only by government employees, his employees in turn stage local firefighting courses.

International course topics this year will include fire behavior, prevention and detection, fuels management, safety, emergency management, suppression, and fire analysis. Special emphasis will be placed on basic firefighting with 4 days of working with hand tools and an actual fireline exercise.

With the exception of Alfaro, all the instructors were once students in the course. It is considered an honor to participate at any level.

The Forest Service's involvement in providing firefighting knowledge and assistance to other countries doesn't stop here. The Forest Service is working with OFDA and USAID to develop a standardized emergency management system similar to the Incident Command System. The payoff, like the firefighters course, will be much more than a transference of knowledge.

"The firefighting course promotes an exchange in technology between countries and participants," Martinez said. He paused, then smiled and added, "You also gain a lot of friends." ■

A New Approach to Fire Research in the South

James T. Paul and Robert C. Thatcher

USDA Forest Service, respectively, project leader, Southern Forest Fire Laboratory, Southeastern Forest Experiment Station, Dry Branch, GA, and assistant director, Southeastern Forest Experiment Station, Asheville, NC

An Institute of Meteorology and Allied Sciences has been established by the Southeastern Forest Experiment Station of the USDA Forest Service at the Southern Forest Fire Laboratory in Macon, GA (fig. 1). Incorporated as a not-for-profit institution under the State laws of Georgia, the institute will seek outside funding from private foundations, forest industry, and State forestry organizations to supplement appropriated funds for fire research in the South. To facilitate this process, steps are also being taken to secure a corporate Federal income tax exemption under Section 501 (c) (3) of the Internal Revenue Code of 1954. Such an exemption will enable the Institute to obtain support from private foundations.

The idea of forming such an institute resulted from two events: (1) a continuing decline in research funding in the Forest Service over the past 10 years, and (2) a growing need among southern forest managers and landowners for new knowledge about effects of meteorology on forestry.

The Forest Service fire research unit led by James T. Paul at Macon has two assigned problems: (1) refining the National Fire Danger Rating System to make it easier to use and more applicable to eastern forest conditions. This would include improving equations to predict stick fuel moisture (fig. 2) from weather variables, and (2) determining impacts and ways to manage the impacts of forestry smoke on highway visibility and safety (fig. 3). These tasks will take all of the appropriated resources of the project for the next 3 years.

Figure 1—*The Southern Forest Fire Laboratory after dedication in 1958.*

If the institute attracts significant funding outside the Forest Service appropriations process, additional research can be done by Forest Service and cooperating scientists. There are many attractive possibilities:

- Effects of weather conditions on fire incidence and severity could be better defined. Staffing schedules for fire standby and suppression could then be improved.
- Better understanding of effects of weather on tree seedling establishment, growth, and survival could lead to greater planting success.
- If relations between weather and insect or disease outbreaks were better understood, damage to forests might be reduced.
- Effects of long-term weather conditions on forest growth and decline in management size areas could be determined. We could then estimate local effects of treatments like prescribed burning or damaging aspects like air pollution.
- Worldwide climatic information could be related to the perform-

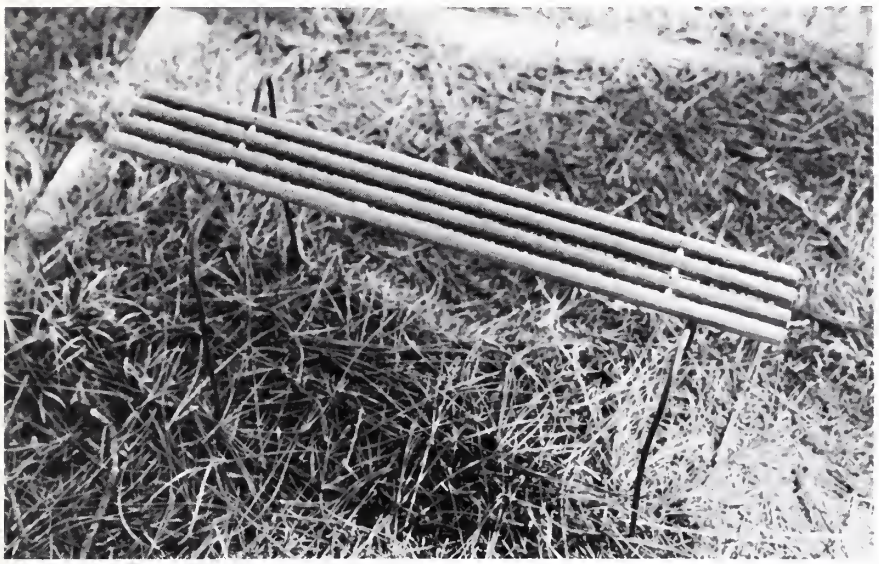


Figure 2—*Ten-hour time lag fuel moisture sticks.*

Figure 3—*Piled debris burning is a major source of forestry smoke.*

ance of forests and associated biological systems in the Southern United States.

The structure of the institute permits work to go beyond laboratory studies into field application and user feedback. Users can help plan and execute studies, and research results can be tested under operational conditions. Cooperating users can describe problems to scientists, and they can disseminate findings to associates once methods are perfected.

Information resulting from the expanded program can then be broadly distributed through existing organizations that normally communicate with large numbers of potential users. Such organizations include USDA Forest Service State and Private Forestry regional and field offices, State forestry organization offices, the Cooperative Extension Service, service foresters and county agents, consultants, and forestry associations.

This approach is untried in fire research, but there is already considerable interest in it. The first measure of success will be the institute's ability to attract funds and energetic cooperators. It needs a variety of people and organizations willing to work together to resolve problems of mutual interest.

If you want to help or if you want more information on plans or progress in the institute, telephone or write to James T. Paul, President, Institute of Meteorology and Allied Sciences, Georgia Forestry Center, Route 1, Box 182A, Dry Branch, GA 31020; Telephone 912/744-0252 or FTS 238-0204. ■

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The Wings of Fire

Jack F. Wilson

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Almost as long as there have been aircraft that could fly over the forests and wildlands, there have been dedicated, visionary, and courageous men who have tried to develop means to use the unique abilities of aircraft to combat fires. To these conceptual and innovative pioneers we owe a great depth of gratitude because they charted the course that has led to the highly efficient and sophisticated use of aircraft in fire suppression that we have today.

The use of aircraft in fire suppression closely parallels the history of the aviation industry. As aircraft were developed and became available, the characteristics and capabilities of the machines were translated into useable techniques and methods to aid in fire suppression. There is no clear and sequential pattern in the genesis of the use of aircraft. Many of the applications among the various types of aircraft were occurring concurrently, and being worked on by the same people. The community was not large, but it operated in a wide scope of activity.

There were three fairly well identified periods of time when particular events and progress were made. These were the intervals between the various wars when the aircraft developed for military purposes became available for use in fire suppression. The first period was from 1919 to about 1940, and the World War I and the first generations of commercial aircraft were developed. The second period was from 1946 to about the early 1960's, when the aircraft developed from World War II became available in the civilian sector. This was the piston engine era of the multi-engine large transport and bomber. The third era followed the Vietnam War, and was the heyday for the turbine engine helicopter, though the helicopter was around in the late 1940's.

One of the earliest incidents of aircraft use in the fire program traces back to a meeting in a bar in San Francisco, CA in early spring of 1919 between one Coert DuBois of the USDA Forest Service and Major H.H. "Hap" Arnold of the U.S. Army Air Corps. (Larkins 1964). They agreed to a program to fly fire detection flights over the Sierra Nevada Range beginning June 1, 1919. Twelve DH4-B's flew for 2 months, and discovered 550 fires. In assessing the damages of the severe 1919 fire season the supervisor of the Idaho National Forest, Emile Grandjean stated "Aeroplane patrols and the increased use of wireless telephones and the possible use of gas grenades and bombs might be helpful in fire suppression." (Larkin 1986). Encouraged by the success, in 1920, 37 aircraft flew over 1300 patrols and discovered 1632 fires. (Wilson 1978). This program was brought to a halt in 1926 for lack of funding; a problem that to this day plagues the use of aircraft in forest firefighting. Without the availability of the government aircraft, the program was shifted to private enterprise, and whatever was done was not documented. In 1925, Forest Inspector Howard Flint and Lt. Nick Mamer began a patrol operation from Spokane, WA. These two were the inspiration of many of the subsequent uses of aircraft, particularly in the Northern Rocky Mountains. The emphasis had shifted to air supply to fire camps and stations, and much of the 1920's was devoted to refining these techniques and building the support facilities (Larkin 1986). During the early depression years, mining again became a popular avocation in the mountain States, and the supply of these isolated mining camps depended on aircraft. At this time, Flint, Mamer, and Bob Johnson at Missoula, MT became active in this work, and a new Travelaire, a tough, single engine aircraft, was acquired, and some new concepts originated (White & Florek 1953). A Utah based forester, T.J. Pearson suggested using smokejumpers for initial attack (Larkin 1986). The official reaction was that it was much too dangerous and wholly impractical. This did not deter Flint and others from continually exploring more things to do with aircraft for fire suppression. While the dropping of personnel was not considered for another decade, the dropping of cargo was developed rapidly in both the United States and Alaska.

Water Bombing

As early as 1929, Flint and Mamer had dropped kegs of water from a Ford trimotor aircraft (Larkin 1986). Also, in 1931 C.J. "Red" Jensen flying out of Sacramento claims to have dropped water on fires near Oroville, CA from water hoppers mounted astraddle the

Figure 1—*Smokejumpers boarding plane in Montana, 1945.*

cockpit of a WWI aircraft (Wilson 1978). The Forest Service in 1935 chartered an Aerial Fire Control Experimental project to test some of the water and bombing projects of Flint and others, but unfortunately about the same time a report from the University of California Physics Department "proved conclusively" that no water would ever get to the ground, so most of the efforts were scrubbed (Larkins 1964). This report set the concept of water bombing (retardant) back 10 years, and it was not until after WW II ended that efforts to develop in this area again began. Work with the smoke jumping concept started again in the late 1930's in both Regions 1 and 6. On July 12, 1940 at 3:57 PM MST on Martin Creek in the Nez Perce National Forest Rufus Robinson and Earl Cooley made the first smokejumper drop on a going fire from a Travelaire flown by Dick Johnson of the Johnson Flying Service at Missoula, MT (Smith 1979). This marked the real beginning of the smokejumper program.

Quite by accident the water bombing concept revived after the crew of the prototype DC-7 transport aircraft elected to jettison his ballast load (water) over the runway at Palm Springs Airport. The 1,300-gallon load produced a wet strip 200 feet wide and nearly a mile long, and discredited the longstanding University of California Physics Department study (Wilson 1978). Free fall tests were continued, and in 1954, Project FIRESTOP, a project headed by Dr. Keith Arnold of the Forest Service's Range and Forest Experiment Station in California (now called Pacific Southwest Forest and Range Experiment Station) began to "test the feasibility of holding small fires in check by dropping water or chemicals on them in free fall" (Murphy 1983). Project FIRESTOP opened the door to a host of innovative ideas. One of interesting significance to the new wonder world of foam was a project done at Camp Pendleton by Major Warren Schroeder, USMC. He designed a tank with glass windows at each end, and attached a detonator to these panels that was controlled electrically. He carried this under a Douglas AD-2, made a low level pass, and spread a foam line 50 feet wide and 300 feet long. This was done in 1954 (Wilson 1978).

It is interesting to note that from 1923 until late 1939 the Federal fire agencies did not attempt to "own" aircraft. They depended heavily on the private sector. In 1938 Region 5 became the proud owner of a Stinson Reliant—probably the first airplane purchased by the USDA Forest Service. A Stinson Voyager was purchased in 1946 in Region 4 (Larkin 1986). After World War II, with the advent of the surplus military programs, a strong move toward owning and operating air fleets began.

Fire Retardant Delivery

One of the first concerted efforts in developing a coordinated retardant program began with the work

of Joe Ely, Fire Control Officer of the Mendocino National Forest at Willows, CA in early 1955. A fleet of N3N's and Stearman aircraft (Navy and Army versions of a biwing training aircraft) that had been successfully used in agricultural crop spraying were modified to drop water and chemicals. They could carry up to 150 gallons, but usually carried 120. The first Air Tanker Base was developed at Chester, CA by Joe Gorrell, and consisted of a 1,000-gallon tank, mixing equipment, pumps, air delivery systems, and housing for the crews. In 1956, seven aircraft became a part of California's fire fighting force (Murphy 1987). Initially these aircraft dropped water, but in 1957 a chemical called sodium calcium borate, a product mined in Death Valley, CA was introduced as a retardant. From this came the term "Borate Bombers." Borate was a sterilant, very heavy and abrasive, and caused several mechanical problems to the aircraft, so active searches for new products in rapid order moved through bentonite, Algin Gel—a product from sea weed, to some very complex formulations. At the same time the development of larger aircraft and better tanking systems was ongoing. In late 1956, the USDA Forest Service acquired eight surplus TBM (Navy Torpedo Bomber) aircraft, and a 400-gallon tank was constructed by the California Division of Forestry at Davis. By 1957 there were 26 TBM's in operation (Wilson 1978). A unique management system evolved. The Forest Service owned

Figure 2—*Sodium calcium borate drop.*

the aircraft, but they were contracted to a private operator who then maintained and operated them for the Forest Service. The first TBM's came to the intermountain area in the summer of 1959 when the Reeder Flying Service in Twin Falls, ID received three of these aircraft, and they were extensively used and tested by the two BLM Districts and the Sawtooth National Forest. The trend toward the larger, faster, larger-load-capacity aircraft moved rapidly. The B-25 came into Boise in 1959 when Bob Savaria introduced his fleet. Bob was also working on a KC-97, a monster, 400-gallon-plus-aircraft, and it was used on Idaho fires in 1959 at Blacks Creek. Jim Larkin flew as co-pilot. It was again used in California in 1960, but vanished from the scene until resurrected in Alaska in 1984 for use in the State of Alaska. In rapid succession came the B-25, B-26, B-18, PV2, PBY, PB4Y2, AF, AJ, C-119, P2V, F7F, the military vintage aircraft, and then the civilian airliners that had become obsolete for passenger transport—the DC-4, DC-6, and the DC-7. All were reciprocating engine aircraft, though the C-119 and the P2V were jet assisted.

In 1971, the State of California received four twin-engine Grumman S2-F tracker aircraft on bailment from the U.S. Navy. The aircraft were later transferred to the USDA Forest Service and are still on loan to the California Department of Forestry. There were as many as 19 in operation by CDF. This represented a major change in the philosophy of management, for these aircraft were owned by the Forest Service and operated by the State. Tanks were designed for the S2-F by Floyd Wakeley, one of the pioneers in tanking design.

In 1972, after receiving great pressure from the aerospace industry and local constituencies to use military aircraft to assist in suppression on large fires, the Lockheed C-130, a military heavy cargo aircraft, was equipped with a specially designed pressure system that was easily attached inside this aircraft. This aircraft would carry 3,000 gallons of retardant. It was very successful, and an additional seven systems were purchased in 1974. These are still operational today. Eight modular airborne firefighting systems (MAFFS) are now available.

At the peak of the large retardant era, as many as 110 aircraft were available. Today there are only about 60. This does not include MAFFS or State aircraft. Now again, the old bugaboo—lack of funds—is making severe inroads.

We are again beginning to look at "small air tankers" from the crop spraying area. BLM is particularly active in this area.

Daring, innovative pioneers have helped advance the use of aviation in fire management to this point. More successful aircraft innovations will follow as long as safety and cooperation are our watchwords.■

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International Meeting on Wildland Fire Challenges

A fire problem that has devastated nations around the globe will be the focus of an international conference, "Meeting Global Wildland Fire Challenges: The People, The Land, The Resources," in Boston, MA, in July 1989. Over the past few years, fires of incredible proportion have occurred not just in the United States and China, but in other countries such as Canada, Greece, Australia, and several African nations. To assess the magnitude of wildfire management problems and heighten awareness and increase mutual cooperation and communication, the USDA Forest Service (USFS) has joined forces with the Canadian Forestry Service (CFS) and the National Fire Protection Association (NFPA) in sponsoring this meeting.

The conference is expected to draw attendees from around the world, providing "a genuine opportunity for exchange of ideas, recommendations and solutions," according to conference planners. It will be held July 24 through July 26, 1989, at the Boston Marriott Copley Place. Although registration materials will not be available until early next year, those interested in advance information may contact Gary Tokle (NFPA) or John Marker (USFS).

The USFS, NFPA, and CFS are partners in the Wildland/Urban Initiative, an effort developed to curtail a fire problem that has been growing since World War II. The fire protection of wildlands has changed considerably since then, with homes haphazardly developed in areas ill equipped for such growth. Today, fighting wildfires requires multiple approaches with structures and lives at stake.

As the problem has continued to grow it has become clear that it is one of world concern—the same motivational forces are bringing about population shifts globally. It is for this reason that the international conference has been planned—the first ever of this magnitude. ■

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Role of Social Science in the Urban/Wildland Complex

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Florida State forester (retired), Tallahassee, FL

In these days when we read so much about stress, it's no wonder that people who work in high-pressure jobs are choosing more and more often to build a home in a natural setting. We know how relaxing it can be to have the privacy and other benefits of a home in a wooded area. We shouldn't be surprised, then, at the growing trend toward wildland sites for homes, as either primary residences or a home away from home.

To be realistic, I think we have to accept the fact that people are going to live wherever they choose to live and why they choose to live in a certain location is not something we can change, even if it jeopardizes their lives and property. What we can work to change, however, is how fire agencies protect people who choose to live in wildland/urban interface, and also how people can better protect themselves.

We know people are going to build in this environment; we're not going to reverse a trend that's been growing for more than 40 years. People in California realized after World War II that it was nice to get away from the city.

In Florida, where nearly half of our land area is forested, we face a truly serious problem. In May 1985, we lost more than 100 expensive homes in Palm Coast, an area that many people would not have considered a wildland/urban setting. The development was built in what was at one time a planted forest, and many of the trees were left among the homes. It wasn't like a forest in the usual sense of the word. There was a golf course, paved roads, shopping centers, community buildings and lot of open spaces.

In short, a trained observer might have seen the hazards, but it would have taken a very knowledgeable citizen to look around Palm Coast and feel any concern that he and his neighbors were placing themselves in harm's way. It just didn't look like the kind of development that could become a blazing inferno and destroy some 100 homes and melt their contents, which included garaged cars, television sets, and refrigerators. But that's exactly what happened on May 17, 1985, a day we still refer to in Florida fire-fighting circles as "Black Friday."

A survey conducted about a year after the Palm Coast fire revealed several things that could have made a difference. One of the most important was the proximity of fuel to the structure. Another of significance involved building materials. The study showed that 57 percent of the homes burned where the fire burned in the tops or crowns of trees; but only 12 percent burned where the fire did not crown. The crown fires occurred most often in those areas where ground fuel was present and fed the fire, allowing it to move from the ground into the branches. We need to emphasize this hazard to owners of homes in these settings because they can reduce the ground fuel themselves to minimize this danger.

Obviously, we knew that certain building materials would be more susceptible to fire damage than others. What surprised us most was the role of soffit vents. Our District Forester, who initiated and guided the fire survey, noticed that homes having fiberglass soffit vents seemed to have suffered more damage or been more likely to be destroyed than homes with metal or plastic vents. He speculated that the fiberglass soffit vents melted quickly from the heat of nearby fires and, as heat built up in the houses, the convection of air through the melted vents increased and pulled embers into the attics.

He said it appeared that the metal and plastic vents did not melt, and kept the embers from getting into the attic.

This is not intended to be a criticism of fiberglass. I'm merely pointing out a conclusion that we reached on the basis of our survey findings. Whether our conclusion with regard to the soffit vents is correct will have to be verified by further study.

We cannot overlook any possibility when it comes to precautions that we should urge people to take when they build in the wildland/urban interface.

Fire intensity as determined by whether the fire crowned or stayed on the ground was the dominant factor in our analysis. This was followed by **soffit vent material, type of exterior, and brush and tree clearance.** Another factor we uncovered was **fire moving from the fuels of undeveloped lots** to ignite homes on adjacent lots. Because of this, we believe that eliminating those fuels by controlled burning would have lessened the damage and destruction in Palm Coast.

So where do we stand with regard to fire protection in the wild-

land/urban interface? I'm sure we can agree that protecting those homes from wildfires is going to continue to be a problem that needs more study and more research.

We have so much to do in fire management and research that it's overwhelming. However, we must look at the whole picture in order to find areas where we stand the greatest chance of improving our fire programs. And we must be practical, targeting carefully our scarce financial resources.

I do not believe that our best interests lie in sociological research. What difference does it make why people choose to live in wooded areas? Finding the specific answer to that question might be intellectually interesting but would serve no practical purpose and would merely consume precious dollars that could be spent on more valuable research.

I see five major areas that require our attention if we are to cope with this continuing problem. Let me list them—not necessarily in the order of their importance—and then discuss them. The five areas I would emphasize are:

1. Firefighter training.
2. Equipment.
3. Mutual aid and cooperation.
4. Subdivision and home design.
5. New technology in building materials.

1. Firefighter Training

Most firefighters are trained to fight either structural fires or wildland fires. Forestry personnel are not trained or equipped to fight structural fires, and municipal fire departments are usually not trained or equipped to fight a wildfire. In both cases, the firefighters are forced to adopt suppression tactics for which they are neither equipped nor trained.

So what we need to develop is a program aimed at training wildland firefighters in the techniques used to suppress wildland as well as structural fires. This should be modified as necessary, of course, so that major emphasis is placed on the type of fire most likely to be encountered, but with enough attention to the other type so that firefighters will know what to do in different situations.

2. Equipment

Equipment is designed much like our firefighters are trained—to handle either structural or wildland fires. Tractor-plow units don't carry water hoses and water wagons can't plow fire lines; yet there are occasions when each type of firefighter wishes he had the other kind of equipment.

I don't know what the answer is so I'll fall back on that old cliche that "surely a nation that put a man on the moon can design a piece of equipment that can fight both structural and wildland fires." Some work is being done in that area now.

3. Mutual Aid and Cooperation

Mutual aid and cooperation is an area where we have come a long way—but there is much still to be done.

The National Interagency Incident Management System (NIIMS) combines the best elements of the structural and wildland fire management systems. It allows all emergency response agencies to work together under a common plan without losing any of their pride, identity, or independence.

Florida was one of the first State forestry agencies to adopt NIIMS, and our experience in 1985, when an estimated 150,000 acres of woodland were burning at one time, confirmed our opinion of NIIMS as an effective way to handle any emergency.

On Black Friday, civilian defense units, local volunteer and municipal fire departments, the National Guard, and Federal agencies worked together as a smoothly operating team, and that reinforced the efforts of each agency. The result was quick response to emergency situations, almost immediate movement of personnel to critical areas, and a well-orchestrated media relations program that kept the press up to date on developments.

NIIMS has proved itself to be a viable means by which various agencies can cooperate with each other in time of emergencies, whether these be fires, hurricanes, flood, or drought. Our big push here then should be mainly to encourage those agencies that are not now members of NIIMS to join with us.

4. Subdivision and Home Design

If we are to do anything about subdivision and home design, we will have to conceive a broad educational program. Such a program must reach developers, home-

The National Interagency Management System has allowed the Florida emergency agencies to effectively combine their resources.

owners, fire protection agencies local and regional planners, the media, insurance carriers, builders, contractors, and architects. All of these people and agencies to one degree or another can influence the type of homes built in the wildland/urban interface.

There is no need to discuss each one separately because I believe their effect on developments in the wildland/urban interface is self-explantory. Each, by direct action or interaction with the others, can bring about an awareness of the hazards of forested communities and cause action to be taken to minimize these hazards.

5. New Technology in Building Materials

Finally, we need to push for new technology in building materials. Well developed marketing techniques can be applied here with the confidence that the people are a representative mix of society in that area.

There are already on the market such products as fire resistant wood that survives flames that turn ordinary wood to ashes. We need to encourage more research into products like this, and to studies that might indicate, as our Palm Coast study did, the possibility that certain materials might add to fire hazard.

Meeting the Challenge

I believe you will all agree that our lives are filled with challenges. We must react to these challenges; we must learn to adjust—to adapt effectively to the changes taking place in our total environment. That's an effective survival philosophy that separates the progressive achievers from those who cling to the "Let's Don't Change" philosophy, which is counterproductive and can be fatal.

We must continually modify our thinking and our actions. We can't think and act today as we did just a few years ago. Our environment has changed and continues to change too much for that.

I really don't believe we can eliminate the problem. Because of what society is doing and because of circumstances that can come together—the circumstances of geography, the layout of the wildland/urban community, the weather, and the fuel—a catastrophic situation can always occur. But we can significantly reduce the likelihood, and when it does happen, we can reduce the severity.

Keeping our responsibilities attuned to the needs of the communities we serve will continue to be one of our greatest challenges. I'm sure we have the desire, the ability, and the spirit to meet the challenge. ■

Wyoming Engine Strike Teams

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For the fourth year running, the Wyoming State Forestry Division has dispatched excess military 2½-ton 6x6's on loan from the USDA Forest Service in the form of 1,000-gallon engines (ICS Type 3/5) to fire complexes requiring engine assistance. The most recent activity included 24 engines dispatched to northern California to the Klamath and Shasta-Trinity National Forests. The unusual portion of this package consisted of county volunteer firemen trained and equipped to Interagency standards for national dispatch. The package included one carded engine boss and two engine operators per engine with strike team leaders and State Forestry Liaison.

The engines are dispatched in five-engine strike teams on commercial or county lowboy trailers with two 6x6 engines per lowboy. A sixth engine is always sent, as a spare, for which the fire is not charged unless it's used during a breakdown of the other units. Because of the engines' military nature, spare parts in some form of a cache always accompanies each strike team. For strike teams in excess of 18 engines, a qualified mechanic with military equipment background is also dispatched. Large fires usually have National Guard units present that have always been willing to assist with wreckers for repairs, etc. Their tactical units also have tires and wheels in common with the strike team engines, which at times has facilitated emergency repairs.

The value and advantage of these engines are their structural fire fighting capability and their all-terrain features. They represent a compromise structural/wildland engine with crews trained to handle either structural protection or suppression in addition to wildland hoselays, line holding during burnout, or hot line suppression. Limitations of these strike teams are the 2-week limit on fire line supression in addition to travel time and the need to relieve crews at that time.

Cost advantages include straight time pay with no overtime or per diem during travel for the county firemen in addition to a consolidated itemized bill for the entire strike team for cost analysis. ■

Engines are capable of hot line suppression on cat lines or line holding during burnout.

Wild West logo used on T-shirts, jackets, and magnetic decals being designed for the engines.

Engines awaiting lowboys for loading and dispatch to Klamath National Forest, 1987.

The National Fire Management Analysis System: Flexible Tool

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The National Fire Management Analysis System (NFMAS) is a computerized process used to identify the annual fire program and budget that will provide the most economically efficient fire protection over time. NFMAS is based upon 10 or more years of historical data and economic efficiency. The system exhibits fire fighting costs and changes in resource values that are likely to occur at various funding levels. The system can also be used to identify objectively the most cost effective program mix at a given funding level.

The analysis system estimates the expected annual average Fighting Forest Fire cost (FFF) and net resource value change (NRVC) for a given Forest Fire Protection (FFP) budget based on that budget being held constant over a 10-year period. Since the actual severity of the fire season varies, the FFF and NRVC experienced in a given year may not match the predicted average. Therefore, the FFP budget for a given year may be more or less than the actual needs of that year. However, the FFP budget identified by NFMAS will minimize these annual differences and result in the lowest overall program cost over time and provide an adequate level of forest fire protection.

Development of the National Fire Management Analysis System

Prior to 1978, USDA Forest Service suppression capabilities were planned for achieving control of fires at 10 acres or less on 90 percent of the days during fire season. Control was to be obtained by 10 a.m. the day following the first burning period. The expectation of this planning philosophy was that aggressive initial attack would minimize costs. Contrary to expectations, fire management expenditures rose sharply after implementation of the 10-acre policy. Presuppression costs increased from $47 million in 1971 to $124 million in 1976. Suppression costs also increased during the same period. However, corresponding reductions in losses did not materialize.

As a result of this record, in 1976 the Chief directed that an analysis of fire planning methods and a study of presuppression effectiveness be made. The Office of Management and Budget (OMB), looking at increasing fire budget requests, issued a similar request. The analysis was conducted by the Policy Analysis Staff group in the Washington Office and was completed in 1977. The study suggested that fire management dollars were not being spent in the most effective manner. As a result of the study, national fire management policy was revised to incorporate variable fire suppression standards based upon land management objectives and values at risk in the area of consideration. The revised policy directed that fire management programs be cost-efficient. Shortly after the policy was adopted, the Forest Service initiated the development of a new fire planning process designed to reflect the positive link between fire expenditures and benefits. For the first time, an economic efficiency criterion was formally introduced as a principal component of fire management program planning.

Implementation of the revised policy was difficult. Analytical tools were not yet available to help estimate the efficiency of various fire management programs. Annual program proposals continued to be based on the 1972 planning process and, as a result, costs continued to increase. Congress, alarmed with the rising costs of presuppression spending, directed the Forest Service in 1979 to conduct and incorporate into future budget requests a cost/benefit analysis of the fire management program.

The new planning process was not ready for use when Congress requested the cost/benefit analysis. Therefore, the Forest Service used the "FOCUS" program to comply with Congress's request. "FOCUS" was developed in the early 1970's by researchers at the Riverside Fire Lab with the anticipation that it would gain acceptance as the national planning tool. "FOCUS" subsequently proved to be a complex tool that didn't adequately meet total planning needs. Lacking an alternative, the Forest Service carefully used the program for the initial analysis of six National Forests. The analysis only addressed ground and air initial attack. Although Congress responded favorably, the analysis was not adequate as the basis for a total national fire management budget.

In 1980 the new fire planning process, the Initial Attack Assessment module (IAA), was used on

an operational basis to develop the fire management budget request. Forty-one National Forests were selected to represent the range of fuel and fire behavior situations on National Forest System lands. The results of the analysis were extrapolated to the total National Forest System area to determine total dollar needs at the forest level. Costs for regional and national level programs and for national shared reinforcement resources were added to the forest budget needs to determine the National Forest System FFP budget.

The results of the analysis were successful and resulted in the development of an internal commitment to the analysis process. The IAA module subsequently was revised to incorporate needed improvements that were identified during its initial use. The process also was expanded to integrate with land management planning and program development and budget. Starting in 1981, the Washington Office encouraged the Regions to implement the analysis on all National Forests with a significant fire program. In 1983 the analysis was formally designated as the National Fire Management Analysis System.

NFMAS has been reviewed and accepted by the USDA, OMB, and the House and Senate Appropriation Committees. The National Association of State Foresters has accepted the system as a basis for evaluating the efficiency of non-Federal wildland protection programs.

NFMAS is now used by other State and Federal agencies. In 1982 a pilot study was conducted that used the analysis to determine the most efficient level of fire protection on non-Federal wildlands. Individual States started using the analysis in 1983. Today 90 percent of the States use the analysis. The Bureau of Land Management initiated a pilot study of the analysis in 1986 and will implement the process in 1988.

Planning with the National Fire Management Analysis System

NFMAS is used by the Washington office of the Forest Service to identify the most efficient national program level, assess national consequences of constrained budgets, compare relative efficiency of program levels among Regions, and support fire budget and program recommendations to the U.S. Department of Agriculture, OMB, and the Congress. NFMAS is used on the regional level to compare the relative efficiency of fire program levels among National Forests.

The most important and valuable uses of NFMAS extend beyond identifying the most efficient fire protection budget level. Many fire managers believe that NFMAS can be shelved after the most efficient budget level is identified. Not so! The use of NFMAS for fire planning is only limited by the creativity of the planner.

Many examples of innovative applications of NFMAS are available. The State of Utah used NFMAS to prioritize engine placement. North Dakota has used NFMAS to rank county needs in terms of allocating Federal grant dollars and excess property. The current national airtanker program level was determined through NFMAS outputs. NFMAS also has been used to determine whether investments in Federal excess property are cost effective.

NFMAS can be used to examine endless "what if" alternatives. At the National Forest level, NFMAS has been used to provide support for operational decisions regarding the makeup of initial attack forces. For example, several National Forests have analyzed the impact of using ground forces in lieu of helitack crews. Additionally, the consequences of substituting small helicopters for medium helicopters have been studied using NFMAS.

Other examples of NFMAS use include: evaluating alternative dispatch strategies at the local level; determining the effect of prepositioning initial attack forces; analyzing response time for initial attack; evaluating the impacts of funding allocations; and determining protection responsibilities for agencies contemplating joint protection on adjacent lands.

The Future of the National Fire Management Analysis System

The concept of economic efficiency embodied in NFMAS has finally provided the opportunity for stability in fire planning and analysis. Management does not anticipate any major changes in the process in the future. The objective of the system is to maintain a stable planning process that continues to meet users' needs. Minor revisions may be incorporated to make the

system more responsive to users' needs. However, most changes will be transparent to the user.

NFMAS can be extremely valuable for determining the impacts of increasing or decreasing a fire budget for a local unit. The effect of decreasing the number of engines available to a local unit could have far-reaching consequences on the total resource program of that unit. Decreasing the number of engines could result in an increased demand for fire and resource ground crews. The consequence of decreasing the number of engines available could be less time available for crews to accomplish other resource objectives (i.e., timber sale layout, campground maintenance). Managers should be using NFMAS to evaluate the impacts of program alternatives on their total resource program.

NFMAS can provide important information that needs to be considered when building program proposals. NFMAS does not make decisions; but it does provide valuable information that the line officer or decision maker can objectively base a decision upon. ■

Disposing of FEPP Fire Equipment

The Federal Excess Personal Property (FEPP) Program has been a boon to wildland and rural fire protection in this country for over 30 years. Disposing of the property after it is no longer suitable for fire protection can be worse than the plague, but the General Services Administration (GSA) and other agencies are working on the problem.

Much of the FEPP that becomes available each year comes from the military services and is ideally suited for fire protection. It is rugged, off-road equipment designed to be used under prolonged battle conditions, similar to fire suppression.

Federal agencies acquire FEPP for their own use. The USDA Forest Service picks up FEPP for use on the National Forests and for loan to the State Foresters for fire protection. Both Federal and State users of FEPP suffer the problem of ultimate disposal of that property, especially when unusable property is acquired.

When you no longer have need for FEPP or when it's no longer usable, to minimize disposal time and problems, it is always prudent to:

- Dispose of property promptly when it becomes unusable in the fire program.
- Store property subject to weather conditions under cover. Electronics, canvas and other fabrics, inoperable machinery and vehicles, and items subject to rust or rot must be protected. Damaged property will be determined by GSA "to have no commercial value" and delay disposal of that property.
- Do not remove parts from fire vehicles and other equipment if this could cause disposal problems. Removing cheap components that disable a piece of equipment so that it cannot be operated and lubricated causes moving parts to seize.
- Be wary of acquiring those metals that require exotic welding tools and materials.
- Be wary of acquiring those specialized electronics and gadgets that you would like to turn into fire widgets in your "spare time."
- Acquire only reasonable quantities even though you may not get a second chance at it. Not getting a second chance could be a blessing.
- Advise screeners that it's no crime to come home without freezing some FEPP. Transportation and disposal costs on unusable FEPP are a total waste.
- Advise screeners of the time and energy it takes to properly dispose of FEPP.

Less is Better! ■

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Model for Workforce Diversity

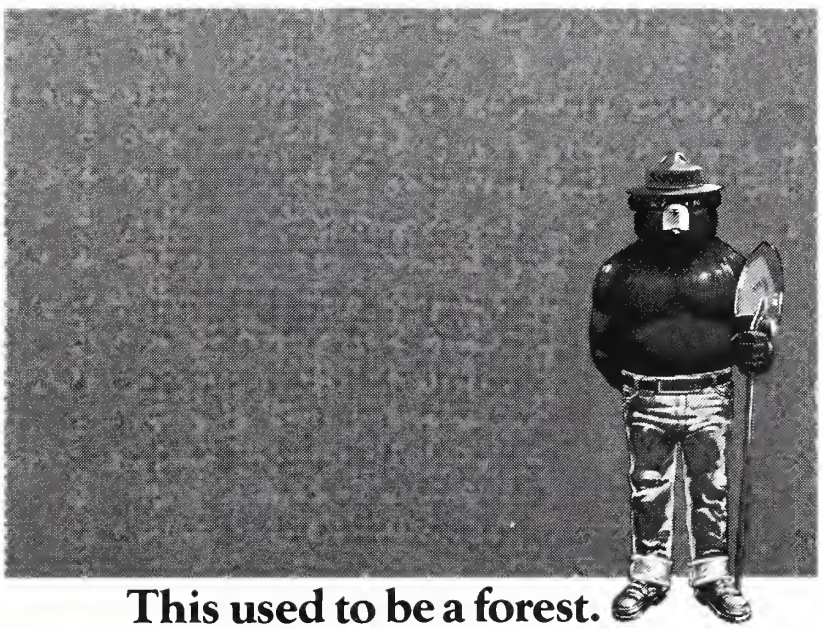
Harry Croft

Budget officer, USDA Forest Service, Washington, DC

Deputy Chief for State and Private Forestry, Al West, has given the go-ahead for a nationwide USDA Forest Service Fire and Aviation Management civil rights effort called "A Model for Workforce Diversity." A seven-member team, led by Doug Bird, Fire and Aviation Management Director of Region 4, formulated an action plan that will assume a major leadership role not only for the Wildland fire management community, but for the entire agency. Other Forest Service members are Karyn Wood, Region 6; Temple Tait-Ochs, Region 8; Van Elsbernd, Washington Office; Preciliano Martin, Region 1; Carol Lyle, Region 4; Jose Cruz, Region 6; and Harry Croft, Washington Office.

The model addresses a long list of civil rights issues that have been specifically associated with the fire management workforce. The thrust of the model is to achieve population parity by increasing representation of women and minorities throughout the fire management organization. "Mic" Amicarella, National Fire Director, organized the team to draft a broader and more responsive approach to deal with past, present, and emerging issues. A hands-on recruitment package, specific and accountable hiring goals, target funding, mentoring, recognition, and a strong program to eliminate inappropriate behavior are a few of the major action items that will be developed in the next several months.

A significant difference from other past affirmative action efforts is noteworthy. This model was produced by "fire people for fire people." Thus many Fire and Aviation Management staff members will be requested to help in the development of operational tasks for the action plan. Fire and Aviation Management has a reputation for accomplishment; completion of the civil rights action items will add to the tradition of responsiveness. As "Mic" said, "We can either be proactive, seeking solutions ourselves to fire management workforce problems, or reactive with others telling us what to do." A final report and action plan will be sent out to regional and field units by the end of the year. Aggressive implementation of the action plan will be a significant challenge and achievement for all fire managers. ■



This used to be a forest.

NFPA To Establish Wildland Fire Section

Dan W. Bailey

Zone fire manager, USDA Forest Service Lolo National Forest, Missoula, MT

The increasing overlap of the wildland and structural fire environments has created new issues and problems for wildland fire management. As a result of this overlap, the National Fire Protection Association (NFPA) is establishing a new membership section, titled the Wildland Fire Management Section. This section will be an ideal forum to share issues, ideas, and concerns about wildland fire management with individuals from both the United States and other countries. Members will have a unique opportunity to identify areas of need for standards and guidelines that will provide state-of-the-art information for all those involved in issues relating to wildland fire.

Those involved in wildland fire management will face many questions over the next 10 years. Some of the questions that the Wildland Fire Management Section will be dealing with include:

- What actions, if any, should land management agencies take to reduce the increasing threat to private homes from wildfires burning on the public and private lands under their protection?
- What can be done to encourage interagency cooperation? Would the preparation of videos and other training materials based on successful programs be beneficial?
- Historically, wildfire suppression efforts have been based on the assumption that the primary values at risk are natural resources. If protecting homes is to become an integral part of fire planning and operations, what changes should be made in the organization and training of wildfire suppression forces?
- What new information and education programs are needed to address the urban/rural/wildland interface fire problems?
- What role does prescribed fire have in inhabited wildlands?

Some of the benefits that the section will provide to members are:

- A newsletter of up-to-date wildland fire management information.
- Opportunity to participate in the development of national and international standards for wildland fire management activities (e.g., the NFPA standard for development and construction in fire-prone wildlands is now in draft form and will be available for review in mid-1988).
- A forum for members to exchange ideas with a much broader audience of individuals concerned with wildland fire management.
- Opportunity to work on special committees addressing particular wildland fire issues.
- Interaction with other NFPA sections and technical committees.
- Access to codes that are used as the basis of legislation and regulation at all levels of government.

Members will have access to both the world's most extensive fire experience data bases and the Charles S. Morgan Technical Library, the largest fire protection collection of information in the United States. The Fire Investigation and Applied Research Division conducts investigations of major fires for use by technical committees, publications, and individuals in the fire community. A large line of magazines, videotapes, slide tape programs, films, and technical publications about free protection is available to members at a discount.

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BLM Smokejumpers

Bureau of Land Management (BLM) smokejumping in the Great Basin began in mid-July 1980, when 15 jumpers and a Volpar aircraft were temporarily detailed to Western Slope Fire Operations in Grand Junction, CO. The plan to augment existing BLM forces with a rapid initial attack capability proved to be very successful and the detail was subsequently renewed until 1985. At that time, logistical considerations dictated the permanent reassignment of 20 smokejumpers from Fairbanks, AK to California BLM. This crew was to be staged out of Redding, CA with the same mission of providing rapid response to fires in the Great Basin. In 1986 these jumpers and an additional 20 from Fairbanks were consolidated at the Boise Interagency Fire Center (BIFC) and housed in the existing loft facility.

The rationale behind the establishment of a BLM jumper program at BIFC is to make available to Great Basin fire control personnel an extremely mobile corps of highly trained and motivated firefighters. These smokejumpers can be used to reinforce and assist existing engine and helicopter forces; provide a pool of strike team leaders, division group supervisors, air attack bosses and fire line explosives experts; and work fires in areas inaccessible to engines or helicopters. Advances in parachute technology, some of them the result of BLM research and development, have opened up areas in the Great Basin previously considered unsafe to jumpers. While wind and terrain still demand great consideration, it is now possible to put people on nearly every fire.

Current plans call for 25 BIFC jumpers to head north in May to assist with the Alaska fire season. They will remain in Fairbanks until mid-July, and then return temporarily to BIFC before being prepositioned in the Great Basin. In early June, a crew of jumpers and a plane will be prepositioned in Las Vegas, NV Other temporary duty stations will include Grand Junction, Carson City, Ely, Elko, and Winnemucca, NV; and Caliente, and Bishop, CA.

The operating philosophy of BLM smokejumpers in Boise, ID, and Fairbanks, AK, is to train and field the best wildland firefighters in the United States. A demanding training program as well as constant improvements in jump-related equipment have created a tough, versatile cadre ready to respond to fire emergencies in virtually any terrain or climatic conditions. ■

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